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Recommended Citation

Mutchler, Leigh A.; Shim, J.P.; and Ormond, Dustin, "Exploratory Study on Users' Behavior: Smartphone Usage" (2011). *AMCIS 2011 Proceedings - All Submissions*. 418.

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Exploratory Study on Users' Behavior: Smartphone Usage

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ABSTRACT

Communication technologies have advanced at unprecedented rates each year. Together with these advances in technology, the Smartphone has emerged and has experienced a dramatic increase in worldwide use. In fact, Smartphones have become the “all-in-one” device or the “Swiss army knife” as they provide mobile access to voice, video, data, and image communications. Even though Smartphones have brought many challenges, the advantages appear to far outweigh the disadvantages. The purpose of this research in progress is to explore what motivates individuals to use Smartphones. Through exploration using both qualitative and quantitative research techniques, this study will categorize current Smartphone usage and examine usage differences between age groups, gender, experience, and other constructs.

Keywords

Smartphone, Exploratory Study, User Behavior, Qualitative Research, Quantitative Research

INTRODUCTION

Over the past several years, a virtual explosion of Smartphone use has swept the globe. The Smartphone is quickly becoming the preferred computing device for many Americans, which has been predicted to be owned by one in five people in the world by 2011 (Minhyung, 2010) and up to 90% of all consumers in the United States by the year 2015. The power of a Smartphone in 2010 has been compared to that of a typical laptop manufactured in 2005 (Roshan, 2010). A Smartphone, the result of the marriage between a mobile phone and a personal digital assistant (PDA), provides mobile access to voice, video, data, and image communications. However, the Smartphone supports more than just communications. Through installed applications or via the Internet, Smartphone users are able to stay connected and be effective, enabling them to “be mobile” in their work, their lifestyle, and their fashion (Webb, 2010). In addition to time saving applications, Smartphones, otherwise dubbed as the “Swiss army knife” of media devices, enhance convenience by providing access to anything, anywhere and anytime, for anyone. The Smartphone empowers a user to perform normal home functions while away from home, enables connectivity with friends and family, facilitates travel plans, and provides sources of entertainment and news (Webb, 2010). The Smartphone is considered by many to be one of the best inventions available to this generation, and the accelerated adoption of Smartphones by consumers is evidence that the trend will continue, as users realize the power of accessing a wealth of information at the touch of their fingertips. Research on Smartphones in information systems may be one of the most challenging research topics today.

Smartphone use brings a multitude of possible benefits throughout many areas of our lives, but brings numerous potential difficulties as well. The heterogeneous nature of Smartphone models in their physical and ergonomic features causes users to often go through a learning curve with each new model (Tarasewich, 2003). Common to all models, the small size of Smartphones often impacts efficiency as fewer search results are displayed, some websites may not support mobile devices, and consistent scrolling is prevalent (Sweeney and Crestani, 2006). Users often need to learn alternate keyboarding techniques when using Smartphones because unique device configurations are required. Mobile application use and development issues exist as well. Since numerous Smartphones do not have a default set of built-in applications with similar features, such as Microsoft Office Suite, new applications must be developed. The mobile application developers face difficulties in programming for the various Smartphone models (Tarasewich, 2003). Users on the other hand must then wade through a vast array of new and unknown applications that frequently lack documentation or other forms of help traditionally supplied with applications (Holtzblatt, 2005).

Smartphones depend on high-speed data access, which may be limited only to areas with larger population densities, introducing use difficulties related to service reliability. Mobile workers in rural areas with limited or no coverage continue to miss out on or reap only a portion of the benefits afforded by Smartphones. For educators, the Smartphone can be a vital tool, but use in rural areas with limited data access coverage reduces the Smartphone's effectiveness. For uses in industry or

academics within areas of reliable data access coverage, other access issues exist, including affordability and recurring costs associated with data plans.

Other Smartphone issues related to use in education are the distractions to students and their peers, and in class devious uses such as cheating during exams. An extremely serious problem caused by Smartphone use is that users often become so preoccupied with the device that they continue to use it anytime, including while operating a vehicle. The distractions caused by a mobile device such as a Smartphone have resulted in traffic accidents in high enough frequency and severity that many states have passed laws restricting use of mobile devices while driving. In the U.S. alone, 8 states prohibit all drivers and 28 other states prohibit novice drivers from operating handhelds. With regards to text messaging, 30 states ban it completely and 8 other states ban it for novice drivers (GHSA, 2011).

As seen with new technologies before, problems also exist with Smartphone use, yet the potential benefits continue to outweigh the difficulties and Smartphone adoption and usage continues to rise. As more Smartphones are put into use and new applications are developed, new uses for Smartphones are realized. A sharp increase in the quantity and type of applications being developed has been seen, enabling more diverse uses for the Smartphone ranging from communication, to productivity, and to entertainment. Therefore, we find it worthwhile to explore the purposes for which Smartphones are being used today.

The majority of students attending colleges and universities today were born between 1980 and 2000 making them members of Generation Y (Harvey and Martinko, 2009), also known as the Internet Generation (IGen). Members of IGen have grown up in the electronic age where computer, Internet, handheld games, and cell phone use is integrated into their lives resulting in the tendency to possess high self-efficacy with technology use (Armour, 2005). Access to the Internet is becoming a critical factor in a college education, and a survey conducted in 2002 found that all college students used the Internet, with 20% having used it since they were between five and eight years old (Jones, 2002). Additional findings in the same study indicated that the Internet was used primarily for communication, entertainment, and education. A study by the same authors a few years later (Jones, Johnson-Yale, Millermaier, and Pérez, 2009) found that the same three uses remained the primary uses of the Internet by college students, with communication continuing to be perceived by students as the most important. Nevertheless, Internet use for entertainment purposes increased while Internet use in education decreased between 2002 and 2005. The overall findings indicated that college students were early technology adopters of Internet tools (Jones et al. 2009). One such Internet tool being adopted by many college students is the Smartphone which provides mobile access to the Internet.

The purpose of this study is to explore the factors that motivate individuals to use Smartphones including the various purposes for which Smartphones are used. Since college students are known to be early adopters of technology (Jones et al., 2009), we will explore Smartphone use by college students as a first step toward a better understanding of this phenomena. Similar to previous studies on Internet use, we expect students use Smartphones for communication, education, and entertainment, and through the exploration of motivational factors and usage purposes, we expect to uncover other categories as well. In addition, we expect our findings will provide more in-depth details about Smartphone use, as well as increase the understanding of the positive and negative impacts of Smartphone use in the lives of college students. The findings of this study will aid IS professionals, mobile application providers, and mobile device service providers in future management, product and service development of mobile technologies.

The remaining report of the present study will first discuss a general overview of the current conditions of Smartphones, including a literature review of related works. Next, we will discuss our research method, comprising of an initial exploratory qualitative phase followed by a larger scale quantitative study. Last, we will present our conclusions and expectations.

CURRENT STATUS AND OVERVIEW OF SMARTPHONES

The Smartphone is widely used throughout Asia, North and South America, Europe, and varies in use in other regions. Smartphone subscribers in the U.S. numbered 63.2 million as of December 2010, making up about a quarter of the total mobile phone market as illustrated in Figure 1. Multiple brands and models of Smartphones are widely available today, models such as Blackberry, iPhone, Palm Pre, Samsung Omnia II and Galaxy, and Google HTC, each with unique features and varying operating systems as seen in Figure 2.

According to a study by comScore (comScore, 2010a), the top mobile market enablers in 2010 were the availability of Smartphones, 3G/4G-enabled mobile phones, and unlimited data plans. Mobile media, defined by comScore as mobile web, access to applications, and access to mobile Internet for web browsing or content download, saw a user increase of 7.6% from 2009. Use of mobile media was attributed to the ownership of Smartphones or 3G/4G mobile devices and subscriptions to unlimited data plans offered by mobile providers. User adoption of Smartphones saw a large increase in the United States, with Smartphones accounting for the top 4 out of 5 devices purchased in 2010, an increase in Smartphone ownership from

16.8% to 27%, with subscriptions to unlimited data plans also increasing from 21.3% to 29%. Similarly, Korea experienced a huge growth in Smartphone usage with the total number of users at 2.2 million as of June 2010, signifying an increase of 300% in Korea (Minhyung, 2010).

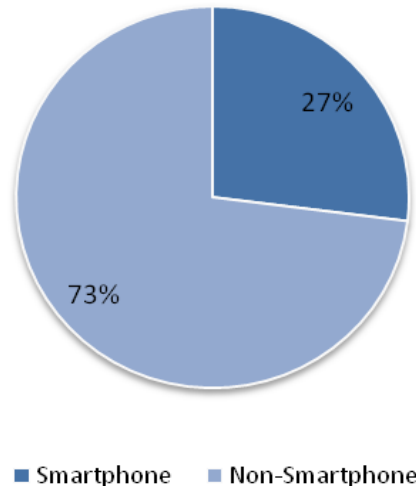


Figure 1. U.S. Smartphone Penetration 3 mo. avg. ending Dec-2010 (source: comScore, 2010a)

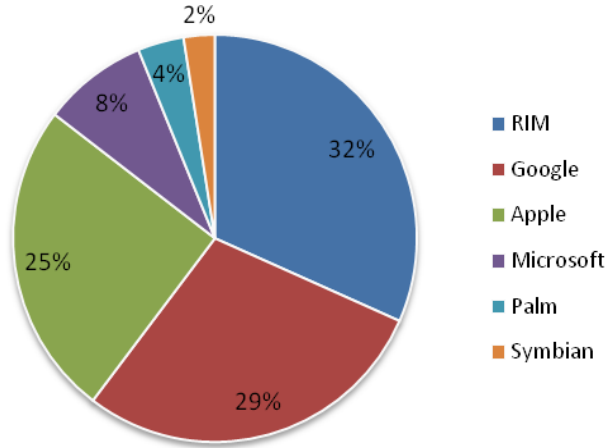


Figure 2: U.S. Smartphone OS Market Share as of Dec-2010 (source: comScore, 2010a)

Throughout 2010, in the mobile industry the user experience was enhanced through improvements in mobile technology, in particular the increasing availability in numerous handset designs and the continued focus on web browsing capability (comScore, 2010a). Differences exist among the various age groups of Smartphone users in the United States, with younger individuals, ages 18-24, accounting for 16.7% of the market and 25-34 year olds accounting for 27.2% of the market. In addition, the United States market experienced its largest increase in use for individuals in their early teens (ages 13-17), up 86% from 2009, and the elderly (ages 55 and older), up 78% from 2009 (comScore, 2010a).

Smartphones enable many different uses such as text messaging, taking photos, and accessing news and information. Figure 3 illustrates the top mobile activities in the U.S. market as of the end of 2010 (comScore, 2010a). Similar activities were

reported in the European market as shown in Figure 4. A recent report by the Pew Research Center's Internet & American Life Project states that not only age differences but also gender differences exist in mobile phone usage. Adults in the United States that install and use applications on their mobile phones are typically male, aged 18-29 years old, and wealthy. The most common applications these adult men use are task-oriented rather than entertainment. Adult women typically install and use applications on their mobile phones for social networking. The average number of applications adults installed on their mobile phones increased by 27% during 2010 (Greengard, 2010).

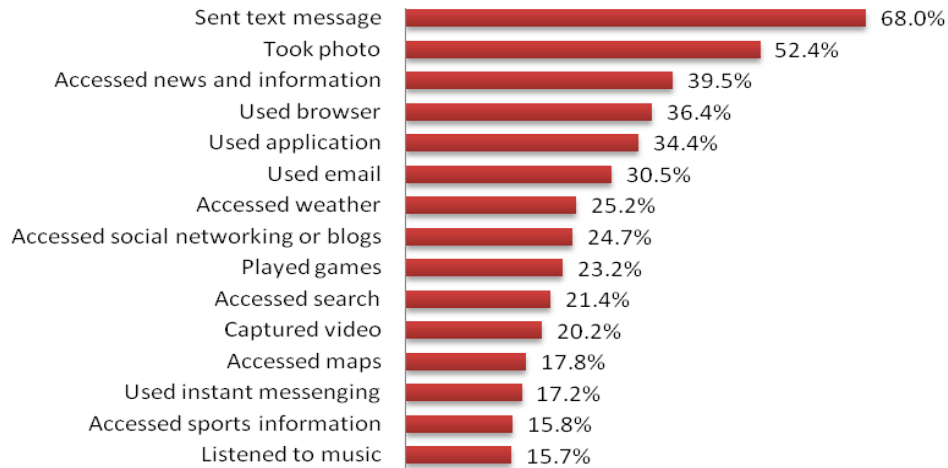


Figure 3: Top Mobile Activities in the U.S. 3 mo. avg. ending Dec-2010 (source: comScore, 2010a)

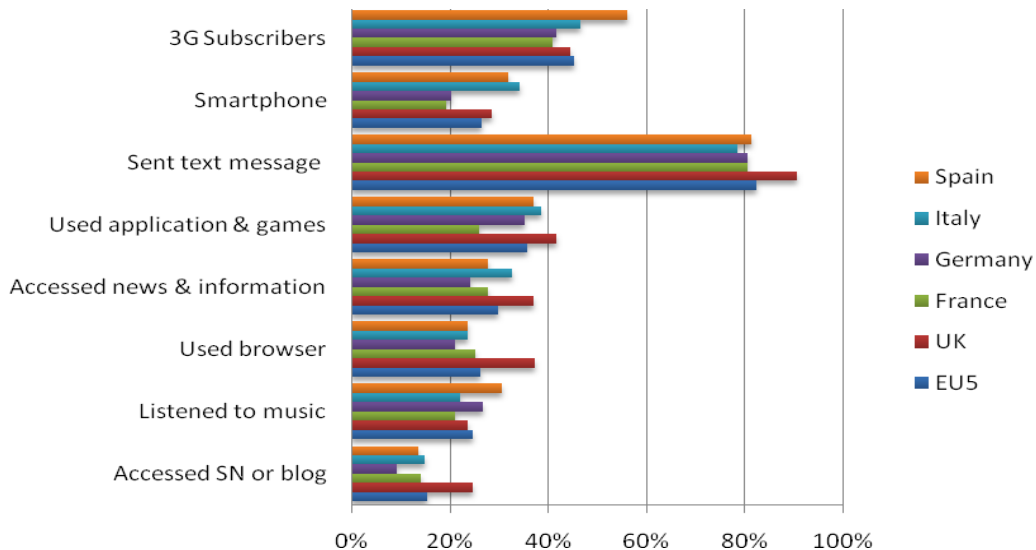


Figure 4: Mobile Benchmark Data for the European Market - Reach % of Mobile Subscribers (source: comScore, 2010b)

We are becoming mobile, and being mobile is a complex concept, dependent upon numerous factors ranging from fashion to technology (Sandin, 2010; Webb, 2010). Wireless networks continue to be implemented enabling the use of mobile devices throughout most well-populated areas. Applications are being developed that take advantage of location-based capabilities, bringing Smartphone users virtually closer and potentially more informed than ever before. These factors make today an opportune time to strive to better understand how Smartphones are being used, including the motivations for use, so that we may begin to fully understand this new concept of being mobile.

LITERATURE REVIEW OF RELATED WORKS

The need to better understand the relationship between individuals and mobile devices is not new but has typically taken primarily a quantitative rather than qualitative stance. For example, in a study on Blackberry users' interaction times and energy consumption, the findings revealed interaction times averaged about 1.68 hours each day, and interactions occurred approximately every 90 seconds and lasted an average of 90 seconds (Oliver, 2010). Another example research examined the impact of mobile phones' capabilities on service usage and found significant differences between the services used by basic mobile phone users versus Smartphone users (Sinisalo and Karjaluo, 2009). Smartphone activity logs have been collected and analyzed to determine actual use to guide future development of networks, batteries, and applications (Shye, Scholbrock, Memik, and Dinda, 2010). Another study collected detailed application usage, data traffic generation, and energy consumption data with a Smartphone application installed on user devices (Falaki, Mahajan, Kandula, Lymberopoulos, Govindan, and Estrin, 2010). Findings of the data analyses revealed valuable implications for the future mobile network and power needs, as well as empirical evidence of the existence of Smartphone "user type" categories. Last, a particularly interesting work by Raento, Oulasvirta, and Eagle (2009) summarized studies that not only explored Smartphone usage but also integrated the Smartphone as a data collection artifact of the research. The reported findings included evidence of service usage to support product development, idea generation for new service products, and real-time behavioral data to use in social network mapping. While these studies serve as the foundation to develop models for behavioral studies, more detailed understanding is needed now on Smartphone use to more fully identify motivational factors and determine the constructs for study.

The early predictions about expected use of the telephone proved to be incorrect (Venkatesh and Brown, 2001), thus predictions of Smartphone use made using traditional techniques may be incorrect as well; therefore, at this early stage of understanding Smartphone use, an exploratory study should be implemented. Qualitative research methods such as interviewing, focus groups, case studies, and other exploratory methods can reveal the functioning of variables perhaps overlooked by survey designers. Through a review of past research, several examples were identified that utilized qualitative methods to explore novel technologies or technology use. In one example, the possibility of using Twitter as a word-of-mouth marketing tool for small to medium sized enterprises was explored (Bulearca and Bulearca, 2010). The study reported on a qualitative phase where interviews were conducted electronically using micro-blogging. Results indicated Twitter may be a useful tool for organizations, and therefore worthy of continued study through quantitative methods. Another study employed a series of focus groups to explore mobile phone use within a specific young minority ethnic group in an attempt to understand relationships between the individuals and the mobile technology use (Green and Singleton, 2007). The analysis results suggested that mobile phones are a key factor in the development of the identities of young individuals, and further study should be performed. In a mixed method study, the predictors of mobile technology use, satisfaction, and performance were found to include ease of use, portability, communication, and productivity-related functionality, as well as factors such as convenience, timeliness and flexibility (Gebauer, 2008). An exploratory focus group study found that for knowledge management system use, best practices should be developed based on experimentation, iteration, and adaptation which should serve as guide for knowledge management system selection (Smith, McKeen, and Jenkin, 2009). A web-based learning management system (LMS) longitudinal qualitative study focused on student concerns and the results identified the LMS, the instructors, and the system administrators as being the most important concerns. Other findings were that system feature preferences of students changed over time, and persistent system problems existed (Zhang and Bhattacharyya, 2008). These example works illustrate how utilizing exploratory techniques approaches a subject of interest in a more general and open-ended way first, without restricting the study to preconceived perceptions and therefore may result in identifying factors previously unknown or overlooked by the researcher. The qualitative results serve to inform the researcher and enable the development of a more significant quantitative study.

RESEARCH METHOD

Qualitative Research Method

To develop an in-depth understanding of the concept of users' behavior of Smartphones, the present study will investigate users' reports on their experiences. The qualitative technique of existential phenomenology will be employed for data collection and interpretation. With this technique, the respondent is encouraged to describe in depth the personally experienced phenomenon, through which the researchers can attempt to learn and understand the respondent's meaning of the experience within its lived context (Thompson, Locander, and Pollio, 1989). A pilot study consisting of in-depth interviews will be performed using a small number of students throughout the summer months of 2011. Example interview questions are found in Appendix A. Three examples follow that represent such in-depth interviews the present research expects to collect. These examples represent three very different types of Smartphone users from various genders and age groups, and Table 1 further represents an example of how the in depth interview findings might be organized. Broad categories such as the three expected to be identified; Communication, Entertainment, and Education, as well as other categories also anticipated but yet

unknown. Within the categories, overlapping uses, pros, and cons may be identified through the analyses of the interviews. This exploratory technique will guide researchers in the present study to develop the survey instrument for the next phase of the project.

Interview example 1: A comment from a female employed in her 30s:

"I have found Smartphones to be my mini-everything....mini-internet, mini-computer and pocket PC, mini-multimedia player, mini-mp3 player, mini-organizer, mini game console, mini-photo and video viewer, and mini-TV ... There's no longer a need for a landline phone, cable modem, let alone a GPS device...The apps are what appear to be most useful...I would use my Smartphone mostly for Internet and as a GPS device. The Bluetooth option is great, especially when driving, and it allows for hands-free while talking on the phone since the phone can be connected to the car's stereo system...The cons about the Smartphone would be that it's a huge distraction while driving, and that the battery drains really quickly. Also, if it doesn't have a pull-out text QWERTY keypad, then I found it hard to really type on the screen itself...it's hard to really type long messages or emails - and I found myself having to abbreviate whenever possible since it would take me twice as long to type on my Smartphone than on a computer. . ."

Interview example 2: One university student in his 20s considers Smartphones as an all-in-one device:

"For me, the Smartphone has revolutionized the way I interact with friends and family, the way I do business and it has been a huge help in life in general....I can easily use my Smartphone to search GPS mapping directions instantly and know where I'm going, who to call....I can also browse websites on my phone, something that I would have said was impossible maybe a decade ago...There are drawbacks[such that] we rely on technology so much that when it breaks down or fails, it becomes a major issue because we take it for granted...some people get so sucked into their Smartphones that they cannot live without one. Their life revolves around the phone and essentially, the phone controls the user. On top of all this, Smartphones noticeably drain the battery much faster than a regular cell phone. All in all, I would say the Smartphone has helped change my life with convenience and instant, on-the-go features. At the same time, sometimes I wonder if the pace of technology is too fast for its own good."

Interview example 3: The experience of the Smartphone use as reported by a teenager:

"When I need to look something up on the Internet, even though a faster Internet connection, like my PC, is available and just in the other room, I still use my phone. I play games, simple ones and also those like you play on a PC that take longer and I can save and continue later. Because I have an iPhone, I always have my music, of course. I keep up with what is going on and what I'm supposed to do on the calendar. I send messages to people on Facebook and stuff. I make to-do lists and notes. I used to read comics on the Internet, but not too much anymore. I watch YouTube and also real movies. . . . Phone calls and text of course. When I'm away from home or out somewhere I use the GPS in my phone to find out where we are or where things like food and stuff is and how to get there. . . . I have a dock with speakers and it runs an app that is a clock and a sleep timer. It plays my music while I sleep."

	Communication	Entertainment	Education	Other
Pros	Business Convenience GPS Internet Social Network	Books Convenience Games GPS Internet Location Services Movies Music	Books Business Convenience GPS Internet Time Management	Convenience Food services Gas services Location Services Time Management Weather services
Cons	Addicting Distracting Battery Life			

Table 1. Example Expected Findings from Qualitative Study

Quantitative Research Method

Instrument Development

Based on the results of the qualitative research and using the Unified Theory of Acceptance & Use of Technology (UTAUT) (Venkatesh, Morris, Davis, and Davis, 2003) as our research framework, the next step of the present study will be to develop an instrument for a more comprehensive study with a larger group of students. The instrument development steps and procedures are listed in Table 2, and a first draft of the survey instrument items are found in Appendix B.

Stage	Steps	Procedures
I: Instrument Development	1. Identification of Measures	Identify measures that will represent the concepts under study.
	2. Content Validity	Validation of items using expert review panel.
	3. Survey Instrument	Finalize the survey instrument based on content validity findings.
II: Pilot Sample Testing and Refinement	1. Data Collection	Pilot Sample: convenience sample of student users Student Sample: Convenience sample of student users
	2. Sample Adequacy	Subject-to-item ratio
	3. Measurement Validity A. Construct Reliability B. Construct Validity	A. Test construct reliability of measures B. Test construct validity of measures
III: Student Sample Testing and Refinement		Further purification of measures

Table 2: Research Methodology Composition

Sample Testing and Refinement

After the pilot sample testing of the instrument, we will sample a large number of students (undergraduate and graduate) in fall, 2011 to test the positive and negative impacts of Smartphone use in the lives of students; to find out whether they use their Smartphone for any of their coursework; their thoughts and feelings on using the Smartphone as it relates to whether it may be a disruption to their work, school, concentration on school; how they feel about design and look, price, and features of Smartphone as a priority, among others. Several statistical methods will be utilized, including an iterative process with multiple reviewers to examine the qualitative data collected in search of common Smartphone usage themes and impacts of

Smartphone use on the lives of students. We expect to perform initial data analyses using statistical techniques such as t-tests to examine the differences found between varying ages, gender, or other group characteristics. Further instrument development will be performed as outlined in Table 2.

EXPECTED FINDINGS AND DISCUSSION

Expected findings include greater Smartphone usage by the younger age groups than by the older age groups, differences in the types and purpose of Smartphone usage between age groups, differences in purpose and usage behavior between genders, ethnicities, and level of prior experience with Smartphones in particular and technology in general. A complete set of findings and details of other interesting qualitative results on users' behavior of Smartphone usage will be presented at AMCIS, 2011.

CONCLUSION AND IMPLICATIONS FOR FUTURE STUDY

The present study represents a research in progress to better understand the Smartphone use through an exploration of motivational factors. This first step in a continuing study focuses on college students, known early adopters of technology. The findings of this study should serve to inform IS professionals, mobile application providers, and mobile device service providers with their future endeavors in the area of mobile device management and service. This study is also expected to provide the foundation for future studies to further explore Smartphone usage implications and to expand across cultural boundaries by examining Smartphone usage in other countries such as Asia and Europe.

Smartphones appear to be the way of the future when it comes to "all-in-one" mobile devices. As Smartphones have garnered a great deal of attention over the past several years, a new category of computers, or "ultra-mobile personal computers" such as the iPad, could very well challenge the landscape of Smartphones for domination of the mobile device market. While ultra-mobile personal computers are a fringe competitor to the Smartphone, it will be interesting to monitor the success or failure of the iPad and the impact that it will have upon the Smartphone world.

As indicated earlier, Smartphones offer users numerous conveniences and are becoming more and more integrated into consumers' everyday lives. Opportunities for advancement in video technology and interactive social media have increasingly become more widely available, as well as openings in the realm of virtual reality. Although the future of Smartphones is uncertain, it is known that user utilization, integration of operational systems into Smartphone devices, mobile operators' response to consumers' demands, and increased competition, among other factors will be a huge determining factor.

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APPENDIX A AND B:

Available on request.